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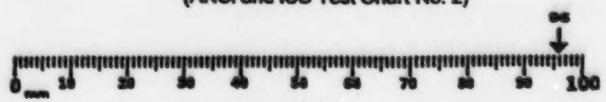

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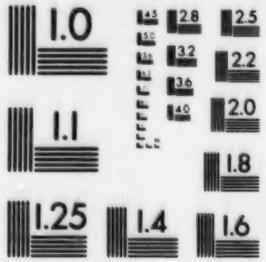

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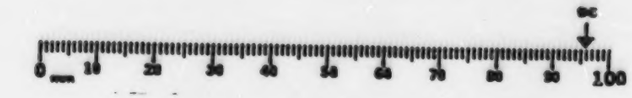

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C.D. Howe Institute
Backgrounder

No. 64, October 2002

The Double Cohort and the Shortage of Faculty:
How Big Are the Problems?

Byron G. Spencer

The Backgrounder in Brief

The recent restructuring of the Ontario Secondary school system means that two successive years of graduating classes will compete for university places in the fall of 2003. Unless admission standards are raised to restrict enrollment, the sheer numbers involved will place extraordinary demands on the universities for half a decade.

About the Author

Byron G. Spencer is professor of economics at McMaster University and Director of the McMaster Research Institute for Quantitative Studies in Economics and Population. He is currently the principal investigator of the SEDAP (Social and Economic Dimensions of an Aging Population) Research Program, a multi-disciplinary multi-university program centred at McMaster and supported by the Social Sciences and Humanities Research Council of Canada, Statistics Canada, and the Canadian Institute for Health Information.

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Two demographic events will have significant effects on the Ontario university system in the next few years. The first event is the growth in the student-age population, which will increase the demand for places. That increase is associated with the baby-boom echo, but it will be exacerbated by the "double cohort" (the two successive years of high school graduates who will enter university in September 2003) and by the trend toward higher enrollment rates. The second event is the retirement of a large portion of the faculty, which will reduce the supply of services that can be provided.

As will become evident from the discussion presented in this *Backgrounder*, the near-term demands on the system will be extraordinary. The universities and the government maintain that "regardless of their program of studies, or when [students] entered high school, students' chances of gaining admission to university will be the same" (Council of Ontario Universities [COU] 2002); however, in the end it is the number of students who seek entry and the number of faculty who are hired that will determine whether the commitment can be honoured. In the following analysis, we show how many qualified students are likely to seek entry, and when. Given the large numbers involved, one surprising finding is how little the additional enrollment would cost the government. We also investigate how many faculty members will be needed, and when, if all qualified students are admitted. While the main interest focuses on what will happen over the next few years, another surprising finding is that even if enough faculty members are hired to meet the needs of the double cohort, the universities will not be left with more than are required once the double cohort has completed university, thanks to the timing of retirements.

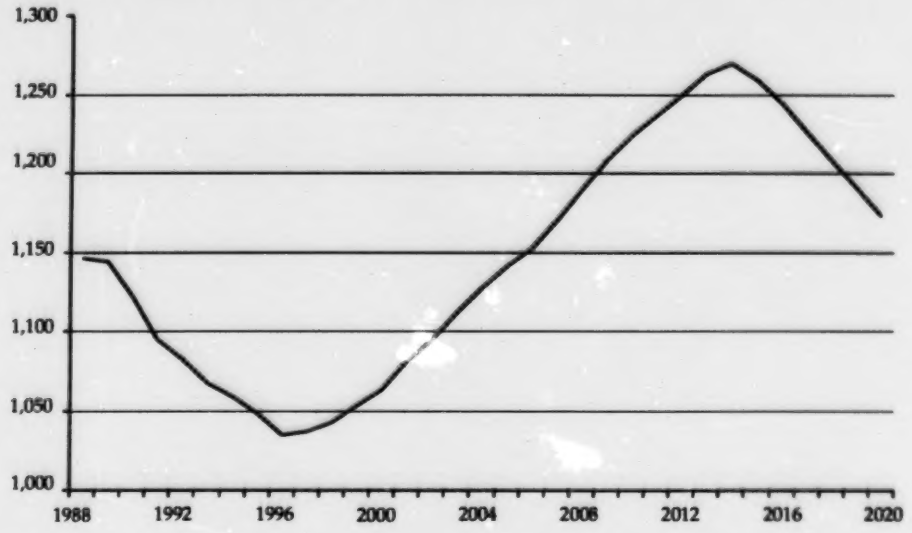
Enrollment

A model was developed to project enrollment for the Ontario university system as a whole.[1] In the model first-year enrollment in full-time studies is related to the population of 18- to 21-year-olds, and calculated as the projected population at each age multiplied by age-specific enrollment rates. Those rates, in turn, vary over the projection period to reflect both the reduction in the age at which students will enter university, as the double cohort is phased in, and a possible increase in the proportion that will attend. Other undergraduate enrollment is related to first-year enrollment in the previous three years, with allowance for attrition. Graduate enrollment is related to earlier enrollment at the undergraduate level, with allowance for trends. Hence the model allows for lagged responses to first-year enrollment that last for many years.

The author is grateful to Jim Donnelly and Margaret Potts of Statistics Canada who provided unpublished data; to Christine Feaver who was responsible for all data handling and computer analysis; and to Frank Denton, Christine Feaver, Henry Jacek, Larry Payton, Leslie Robb, William Robson, and Qaid Silk who provided valuable comments and suggestions. The work underlying the paper was carried out as part of the SEDAP (Social and Economic Dimensions of an Aging Population) Research Program supported by the Social Sciences and Humanities Research Council of Canada, Statistics Canada, and the Canadian Institute for Health Information.

1 A full description is provided in Spencer 2001. Earlier related work includes PricewaterhouseCoopers 1999, Smith 2000, COU 2000, and OCUFA 2001.

Figure 1: ***Population 18–24 ('000)***



Source: Figures for 1988 to 1996 from Statistics Canada; figures for 1997 to 2010 from MacMaster MEDS projection.

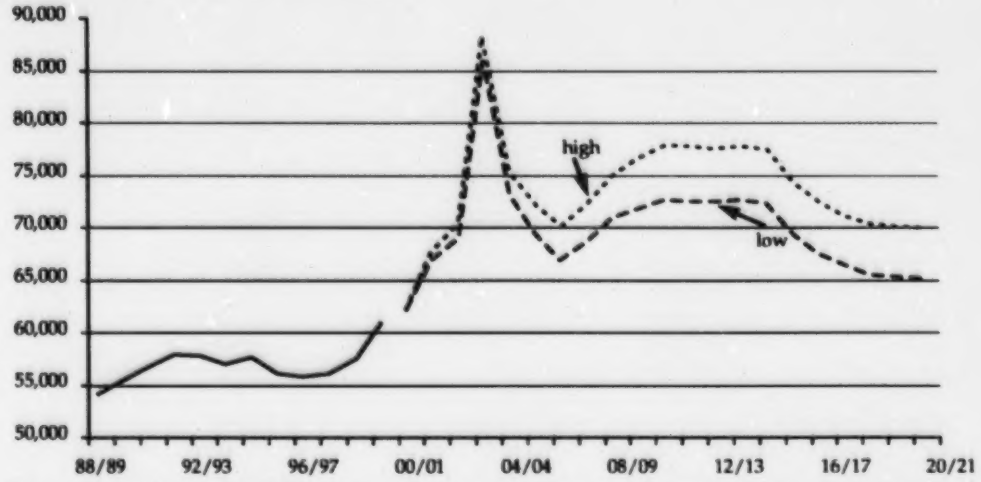
We turn now to consider the enrollment numbers. Almost all university students are drawn from the population age range of 18-to-24. From the late 1980s to 1996 that population declined by about 100,000 (see Figure 1). Since then it has risen steadily; between 2001 and 2014, when the effect of the baby-boom echo will be at its peak, the increase is projected to be about 189,000 or 17.5 percent,[2] after which there will be some decline.

Figure 2 shows first-year full-time enrollment over the same period, with actual figures up to and including 1999–2000 and projected ones thereafter.[3] While the population of 18- to 24-year olds was *smaller* in 1999–2000 than in 1988–89, first-year full-time enrollment was *larger* — 61,000 in 1999–2000 compared with 54,000 in 1988–89 — reflecting notably higher enrollment rates. What can we expect enrollment rates to do in the near-term future? The answer will not be determined by demand alone: as noted, an important factor will be whether the universities are able to accommodate large increases in numbers by making adjustments on the

2 The population projection is based on the McMaster MEDS system; see Denton, Feaver, and Spencer 1997. Within the period shown, the projection is quite insensitive to alternative assumptions about fertility or mortality rates. Alternative assumptions about interprovincial and international migration, on the other hand, would have larger effects, especially toward the end of the period. Only "standard" assumptions are used here. Specifically, total immigration into Canada is assumed to remain at 225,000, consistent with stated government policy, and 55.4 percent of immigrants are assumed to settle in Ontario; net interprovincial migration into Ontario is assumed to move toward zero by 2011 and to remain at that level thereafter.

3 It is regrettable that as of spring 2002 the latest comparable enrollment figures relate to 1999–2000.

Figure 2: ***Year 1 Full-time Enrollment***



Source: Calculations for 1988–89 to 1999–00 based on special tabulations from Statistics Canada; projections based on model enrollment.

Note: Enrollment is related to the population of 18-, 19-, 20-, and 21-year-olds; as the double cohort is phased in between 2001–02 and 2005–06, most of year 1 enrollment shifts from age 19 to age 18. In the "low" projection the enrollment rate is held constant at 41%; in the "high" projection, it increases by three percentage points.

supply side. However, it is useful to ask, as we do here, how many would wish to enrol if they could, as the universities and the government have promised.[4]

Consider first how the double cohort will be phased in. The class that entered grade 9 in the fall of 1998 will be the last to take five years to complete secondary school; most students will enter university at age 19. The next class will take only four years, and enter at age 18. If that were to happen, first-year enrollment would double in the fall of 2003.

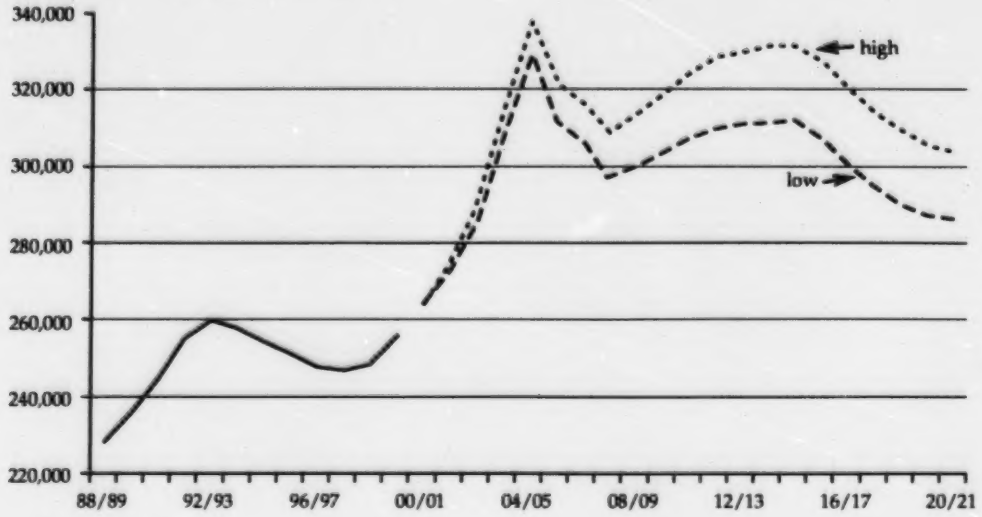
In practice, the response will be more gradual. Some students have already avoided crowded conditions at the universities by completing their secondary school studies in four years; others who come later may postpone their entry.[5] The projections here involve a transition between 1999–2000, when about 70 percent of first-year enrollment was accounted for by 19-year-olds, and 2006–07, when about 70 percent will be accounted for by 18-year-olds. But in 2003-04 high proportions of *both* 18- and 19-year-olds will seek admission. Even though those proportions (about 55 and 60 percent, respectively) are well short of 70 percent, they are enough to increase first-year enrollment in that year by about one-third above what it would have been without the double cohort.[6]

4 As Figure 2 indicates, enrollment growth was relatively gradual in the decade from 1988 to 1998, and was not significantly constrained by lack of facilities or personnel; substantial increases in demand, such as those expected, could make the constraints much more severe.

5 A recent press report states: "Thousands of Ontario high school students are rushing to graduate a year early ... to beat the looming crunch" and "the number of fast-trackers has unexpectedly doubled this year." *The Globe and Mail* (Toronto), February 25, 2002.

6 It is important to note that if the phase-in resulted in a full one-year decline in the mean age of university entrants (e.g., from age 19.5 to age 18.5), the total number of student years of...

Figure 3: ***FTE University Enrollment***



Source: See Figure 2

This phasing-in pattern is applied to the overall enrollment ratio. In 1999–2000, full-time first-year enrollment was such that 41 percent of the then-19-year-old cohort would enrol at some age (most at age 19, but others at 18, 20, 21, and so on). In the "low" projection, as shown in Figure 2, the overall ratio remains 41 percent. In the "high" projection the same change in the age distribution takes place, but the overall enrollment ratio rises gradually by 3 percentage points to 44 percent by 2010–11,[7] and then remains at that level.[8]

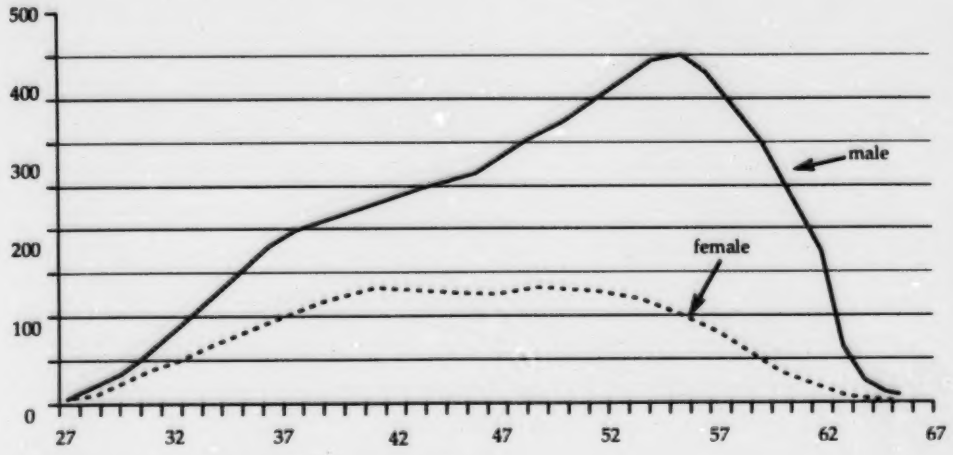
As is evident from Figure 2, both projections are dominated by the double cohort. Even the "low" projection shows an increase in first-year enrollment from 61,000 in 1999–2000 to 86,000 in 2003–04, when the double cohort will have its greatest impact. That peak is about 19,000 higher than in 2006–07. Enrollment is projected to increase in subsequent years, but to remain well below the earlier peak, before declining somewhat after 2014–15.

Note 6 - continued
enrollment over the period of transition would increase by exactly the size of the "additional" part of the double cohort. However, with the assumptions used here, mean age decreases by less than one year, and hence the increase in student years is correspondingly less.

7 By comparison, the enrollment proportion was only 36 percent in 1989–90.

8 One reviewer asked about the accuracy of the projections and how well such projections would have performed in the past. The enrollment projections reported here are *conditional* on the projection of the population, the first-year enrollment rate, and the flow-through of students to second and third enrollment years, and beyond. The components will be less reliable the further into the future that one looks. However, for relatively short periods (of, say, up to ten years) the population projection is likely to be quite accurate (barring major unanticipated changes in migration), and the range of assumptions for the enrollment rate is designed to reflect the unavoidable uncertainty that is associated with future events. See also footnote 10.

Figure 4: ***Age Distribution of Full-time Faculty, 1999–2000***



Source: Based on special tabulation from Statistics Canada.

The sharply higher first-year enrollment is reflected, with appropriate lags, in second, third, and fourth-year undergraduate studies.[9] The impact of the double cohort on undergraduate enrollment at all levels will extend over a number of years and will be large. However, it will be most heavily concentrated in the three academic years 2003–04, 2004–05, and 2005–06: full-time-equivalent undergraduate enrollment in those three years will average some 34,000 to 35,000 (or about 14 percent) more per year with the double cohort than it would have been without it.[10] By the end of the decade, undergraduate enrollment will again be influenced only by the underlying changes in the population and by enrollment rates.

Overall enrollment at all levels, including graduate students, is shown in Figure 3. Without the double cohort, enrollment would have increased by about 10 percent by 2004–05, but the double cohort will result in a further 19 percent increase in demand. By mid-decade the total increase in enrollment will amount to between 30,000 and 50,000 per year — provided, of course, that the university system can cope with the numbers and that the acceptance rate for applications does not (or is not allowed to) decline sharply.[11]

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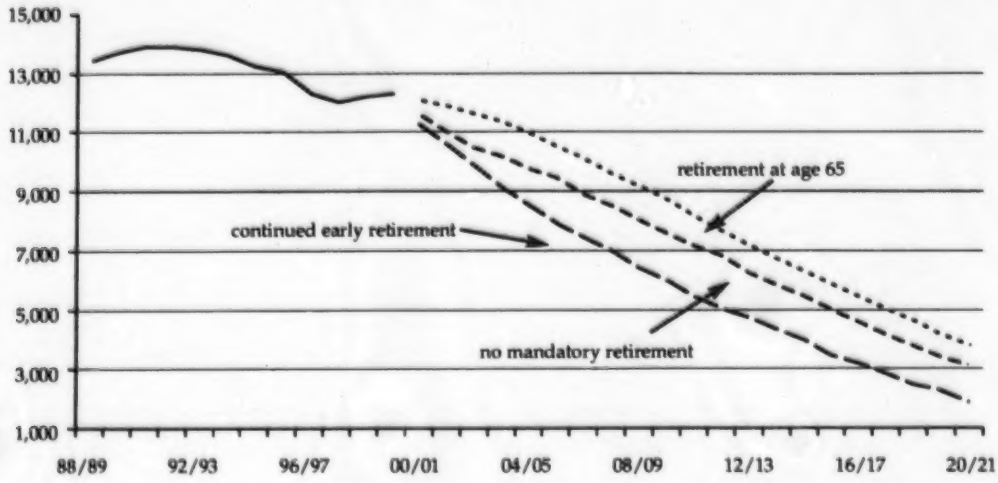
9 In keeping with accepted practice, 3.5 part-time students are deemed equivalent to one full-time student.

10 For the years 2000–01 and 2001–02, we can make limited comparisons between enrollment as projected by the model and preliminary total enrollment figures from the Ontario Ministry of Training, Colleges and Universities. For the two years taken together, the model produces an average projected increase in full-time-equivalent enrollment at the undergraduate level of between 3.23 percent and 3.53 percent per year; the average actual increase as reported by the ministry was 3.51 percent.

11 The projections show a clear peak in 2004–05. Projections prepared jointly by the Ministry of Training, Colleges and Universities (MTCU) and the Council of Ontario Universities (COU) (private correspondence) differ in that they show a plateau rather than a decline after the peak, with subsequent growth taking enrollment above the mid-decade levels by the end of the decade. It is not evident why the MTCU/COU projections do not have a pronounced enrollment peak associated with the double cohort.

Figure 5: ***Full-time University Faculty, Actual to 1999–2000, Without New Appointments to 2002–21***



Source: figures for 1988–89 to 1999–2000 are totals based on special tabulations from Statistics Canada; figures for 2000–01 to 2020–2021 are based on a model of retirement and show the number of non-retired survivors of the 1999–2000 faculty. "Continued early retirement" assumes that age-specific retirement rates observed during the 1994–99 period apply thereafter; "retirement at age 65" assumes that no oone retires before age 65; "no mandatory retirement" assumes a phase-in of US retirement rates by 2003–04.

The Faculty: Current and Prospective Availability

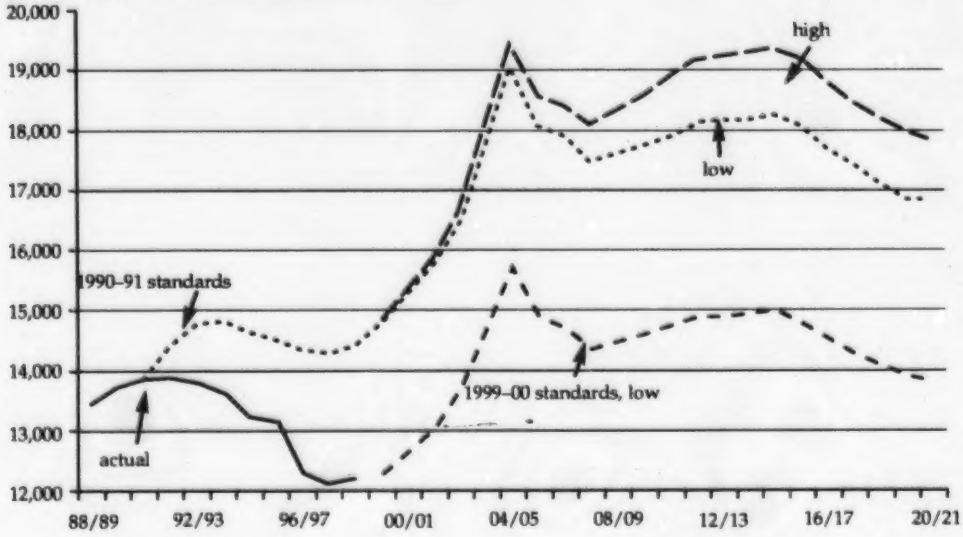
We turn from considerations of *demand* (the annual flow of students who would like to be at university) to considerations of *supply*. And we focus on examining the current complement of full-time faculty, and estimating how many members will be available over the remainder of the decade.

It is obvious from Figure 4, which shows the age distribution of full-time faculty in 1999–2000, that a large proportion is close to retirement. While the male faculty members are, on average, much older than their female counterparts, about one-third of all faculty members are over the age of 55 and *more than half* are over the age of 50. Figure 5 shows the number of full-time faculty for the period from 1988–89 to 1999–2000. The stable faculty size in the first five years of that decade (reflecting a rough balance between recruitment and retirement) contrasts sharply with the marked growth in student numbers (see Figure 3). The 10 percent reduction in faculty size in the next five years (when there was little recruitment but much retirement) coincided with a reduction of about 1 percent in student enrollment.

Of those faculty members employed in 1999–2000, how many will remain full-time staff? Three projections are provided: "continued early retirement" in Figure 5 shows what would happen if recent faculty retirement patterns were maintained;[12]

12 The term "retirement" as used here includes those full-time faculty members who have left the Ontario university system for whatever reason (including death), and is net of any replacement appointments. While "net attrition" would be a more accurate term, almost all net change among those 50 and older is due to retirement in the usual sense.

Figure 6: ***Requirements for University Faculty***



"retirement at age 65" shows what would happen if no one were to retire before age 65. These two cases presumably place outer bounds on what will happen. Even with no early retirement, about 4,100 of the current 12,255 faculty members would retire by the end of this decade; with continued early retirement, the number would be about 6,700.

The third projection shows what might happen with the elimination of mandatory retirement.[13] This is a case of considerable interest since support for this appears to be building. For example, the Canadian Human Rights Act Review Panel (2000) stated that "mandatory retirement is age discrimination" and calls for "a thorough review of the issue" (recommendation 131). The Ontario Human Rights Commission goes further in that it "recommends that the Ontario *Human Rights Code* be amended to eliminate the defence of mandatory retirement at age 65 and to provide protections against age discrimination to workers over 65" (Ontario Human Rights Commission 2001, executive summary).

The projection shown here draws on the experience of the United States, where mandatory retirement in postsecondary institutions has been prohibited since 1994. The projection assumes that by 2003–04 the retirement rates of Ontario faculty will be the same as the observed rates in postsecondary institutions in the United States in 1994–96.[14] What difference would that make? In short, a big difference. Of those who were full-time faculty members in 1999–2000, 14 percent more would still be active in 2004–05, compared with the case of continued early retirement, and 29 percent more by the end of the current decade.

13 The issues are discussed in Gillin and Klassen 2000, Ontario Human Rights Commission 2000, and Canadian Human Rights Act Review Panel 2000, chapter 18.

14 The US age-specific exit rates are drawn from Ashenfelter and Card 2001, figure 4.

Table 1: ***Shortfall of Ontario Full-time University Faculty, Alternative Projections, 1999/00 to 2020/21***

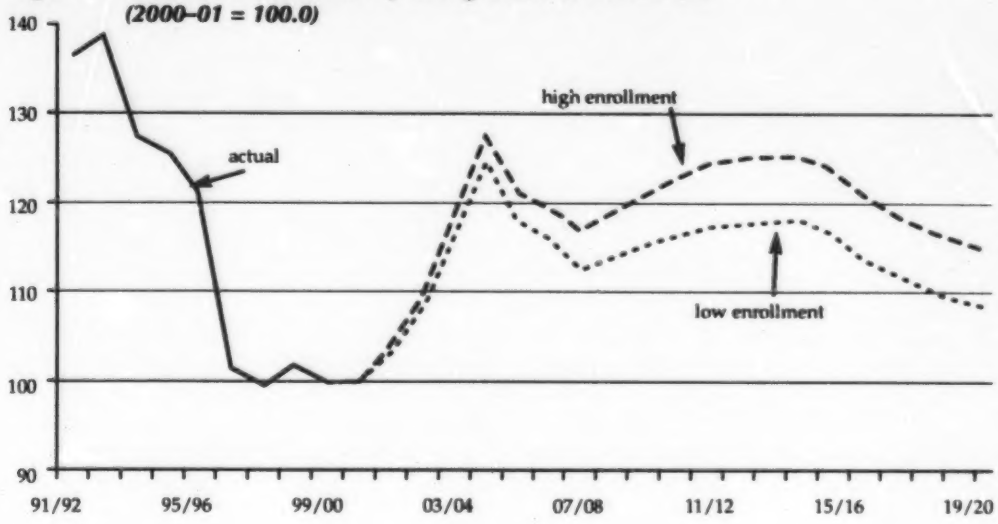
Enrolment	Target Standards and Retirement Patterns	Shortfall of Faculty			
		1999–00	2004–05	2010–11	2020–21
	Target is to maintain 1999-00 standards				
"low"	Early retirement	—	7,133	9,186	11,891
	No mandatory retirement		5,904	7,553	10,707
	Retirement only at age 65	—	4,660	6,556	9,935
"high"	Early retirement	—	7,460	9,980	12,731
	No mandatory retirement		6,231	8,346	11,548
	Retirement only at age 65	—	4,987	7,349	10,776
	Target is to return to 1990–91 standards				
"low"	Early retirement	2,565	10,513	12,382	14,898
	No mandatory retirement	2,565	9,284	10,749	13,715
	Retirement only at age 65	2,565	8,040	9,752	12,943
"high"	Early retirement	2,565	10,915	13,364	15,943
	No mandatory retirement	2,565	9,687	11,730	14,759
	Retirement only at age 65	2,565	10,733	8,443	13,987

Projected Requirements for Faculty

Faculty requirements depend on student numbers, levels of study, and the proportion of students who are part-time. The projections are made under two sets of "standards" (Figure 6). One applies the latest — that is, 1999–2000 — student-faculty ratios, while the other applies the ratios of 1990–91, when faculty size was at its highest level in the decade. The two standards enable us to distinguish between the size of faculty necessary to maintain current student-faculty ratios and the size that would be necessary to regain the standards (in terms of those ratios) that were in place earlier. (To avoid clutter, Figure 6 shows faculty requirements from 1999–2000 for only the "low enrollment" projection.)

Faculty requirements are generally trending upward as a consequence of the projected increases in enrollment, but it is evident that the double cohort will result in a very sharp temporary increase that is especially large for the four academic years 2003–04 through 2006–07. To maintain current standards, universities will need 2,500 more faculty members by the end of the decade than were required in 1999–2000. But a further 900 will be needed before that, in mid-decade, to accommodate the double cohort when its demands are greatest. If, however, the target were to return to the standards of 1990–91, then the universities were already short by 2,565 faculty members in 1999–2000. And the gap is projected to grow.

Figure 7: ***Provincial Government Operating Grants to Universities (2000–01 = 100.0)***



Note: Actual values for 1991–92 to 2000–01 are taken from Table B-1 in *Funding for Ontario Universities* on the Council of Universities website. The values are expressed in 2000–01 constant dollars based on the consumer price index. Values for 2001–02 and later years show the level of operating grants that would be required to maintain support at the level provided in 2000–01.

Projected Shortfall of Faculty: Implications for Recruitment

Figure 6 indicates that faculty requirements will increase by at least 20 percent between 1999–2000 and 2010–11 if the target is just to maintain current standards; furthermore, Figure 5 indicates that at least 33 percent of current faculty will retire in that same period. Those two numbers alone suggest that the need for net recruitment in this decade alone is equivalent to more than 50 percent of current faculty size.

Table 1 provides some helpful cases. For example, with current standards, high enrollment, and early retirement (perhaps the most likely case), an additional 7,460 full-time faculty members would have to be hired in the five years ending in 2004–05. With the current complement totalling about 12,000, that represents an enormous recruitment challenge. Eliminating mandatory retirement would reduce the need for faculty recruitment by roughly one-sixth. Reducing the number of faculty members taking early retirement would also be helpful. Even so, most would have to be recruited.[15]

Suppose that enough faculty members were hired. Would the universities be left with surplus faculty once the double cohort has graduated? The projections indicate otherwise. While almost 1,500 additional per year, on average, would be needed in the five years ending in 2004–05, a further 420 per year would be needed

15 Alternative recruitment strategies are available to the universities, including greater reliance on sessional lecturers and others without full-time appointments. However, the analysis here is concerned with the requirements in terms of faculty appointments to maintain recent full-time (as well as other) faculty-student ratios.

between 2004–05 and 2010–11, and 275 per year in the decade following. Thus, it is important to note that the projections indicate no surplus in later years if enough faculty members are recruited to accommodate the needs of the double cohort.[16] In fact, as a result of the large number of future retirements, recruitment would continue, though at a lower level.

How Much Will It Cost the Government?

What are the cost implications of the projected increases in enrollment, and specifically those costs that are borne publicly? In Ontario, provincial government support for universities comes in two main forms: operating grants and capital grants. It is convenient and informative to focus on the operating grant portion, which accounted for about 94 percent of total government support over the last ten years. (By contrast, capital grants varied enormously from year to year, ranging from two-to- 28 percent of the total.)

The projection portion of Figure 7 shows how much it would cost the government, year by year from 2000–01 to the end of the projection period, to maintain its allocation to universities at the same (inflation-adjusted) level per full-time equivalent student as in 2000–01. The sharp increase in costs as the double cohort is phased in is to be expected, and it is not surprising that the operating grant to universities reaches a peak in 2004–05, when the effect of the double cohort has its greatest impact on enrollment. In that year the grant would have to increase (in real terms) by between 25 percent ("low" projected enrollment) and 27 percent ("high" projected enrollment) over their 2000–01 levels in order to maintain the level of support per full-time-equivalent student that was provided then — an increase of more than $400 million. Of course that alone would not be sufficient to provide the additional faculty and facilities that would be required. Operating grants accounted for only about 30 percent of all university revenue in 2000–2001; other sources of revenue would have to increase in roughly similar proportions.

More remarkable than the prospective increase in cost, however, is the comparison with earlier years. The portion labelled "actual" in Figure 7 shows the total value of operating grants historically, after adjustment for inflation. The extent of decline during the 1990s is apparent: the grants were worth almost 40 percent more at the beginning of the decade than they were at the end. Indeed, the value of the per student operating grant could increase by about 10 percent (11 with high enrollment, 9 with low) and the projected cost to the government would still remain below levels of the early 1990s.

16 The year-by-year projections indicate that if the universities actually hired about 1,500 faculty per year in the five years ending in 2004–05 there would be a small surplus in 2005–06. Without further recruitment even that surplus would disappear the following year. However, it seems unlikely that any surplus will materialize. Preliminary figures indicate that recruitment was well below projected increases in requirements for the 2000–01 academic year.

Conclusions

The recent restructuring of the Ontario secondary school system means that two successive years of graduating classes will compete for university places in the fall of 2003. Unless admission standards are raised to restrict enrollment, the sheer numbers involved will place extraordinary demands on the universities for half a decade. The demands will be difficult to accommodate, not least because more than half of the current faculty members are over the age of 50, and most will soon retire. However, we explore what will happen if the commitment made to students by the universities and the government is honoured, and enrollment is not restricted.

The major conclusions relating to student numbers are the following:

- The effects of the double cohort on the demand for places in Ontario universities will peak in 2004–05, but will dominate the middle five years of this decade;
- First-year undergraduate enrollment will be more than 40 percent (or 26,000 students) greater in 2003–04 than it was in 1999–2000; four-fifths of that increase will be the direct result of the double cohort; and
- Total undergraduate enrollment will be almost one-third (about 70,000 full-time-equivalent students) greater at its peak in 2004–05 than five years earlier; about two-thirds of that increase will be the direct result of the double cohort.

The following are the major conclusions relating to faculty requirements and the need for recruitment in order to respond to the increases in student numbers:

- Recruitment of new faculty members in unprecedented numbers ¾ more than 7,000 by 2004 and another 2,000 by 2010 — is essential if the university system at the end of this decade is to have standards even close to those in place at the beginning of the decade;
- A successful program of faculty recruitment would not result in surplus faculty once the double cohort has finished university;
- The ability of the university system as a whole to cope with the increase in enrollment will be significantly affected by the rate at which faculty members take early retirement or opt to stay on; and
- Eliminating mandatory retirement could reduce the need for recruitment by about one-sixth.

Finally, with respect to cost:

- By 2004–05, provincial government operating grants (which account for the major part of provincial government financial support to universities in Ontario) will need to increase by 25-to-27 percent over 2000–01 levels if the double cohort is to have the same support in real per capita terms as those who were enrolled at the beginning of the decade; that would mean a budget increase of more than $400 million;
- Even an increase of 25-to-27 percent would leave total provincial government support in mid-decade far below what it was in the early 1990s.

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